

AMENDMENTS TO THE CLAIMS:

This listing of claims will replace all prior versions, and listings, of claims in the application:

IN THE CLAIMS:

1. (Currently Amended) ~~A Radiation-lead-substitute radiation protection apron of lead substitute material for radiation protection purposes against radiation resulting from in the energy range of an X-ray tube having a voltage of from 60 to 140 kV, said apron comprising a structure of at least two a first and a second protective layers-layer of different compositions which are separate or joined together, wherein said first the protective layer(s) layer comprises predominantly atomic elements of a first atomic number and is designed to be located on a part of the apron more remote farther away than the second protective layer from a skin layer of a wearer when worn by a wearer, body being protected comprise(s) predominantly the elements having a lower atomic number, or their compounds, and the protective layer(s) close to the body being protected comprise(s) predominantly the elements having a higher atomic number, or their compounds, and said second protective layer comprises predominantly atomic elements of a second atomic number and is designed to be located on a part of the apron closer than the first protective layer to the skin layer of the wearer when worn by the wearer, wherein said first atomic number is lower than said second atomic number, and wherein for nominal overall lead equivalents of from 0.25 to 2.0 mm the lead substitute material comprises~~

~~from 12 to 22 wt. % matrix material,~~

~~from 0^{[[up]]} to 75 wt. % Sn or Sn compounds,~~

~~from 0^{[[up]]} to 73 wt. % W or W compounds, and~~

~~from 0^{[[up]]} to 80 wt. % Bi or Bi compounds, and~~

~~wherein not more than one of the constituents is 0 wt. %.~~

2. (Currently Amended) ~~The radiationRadiation-protection apron of lead-substitute material according to claim 1, characterised in that wherein the lead substitute material comprises~~

~~from 12 to 22 wt. % matrix material,~~

~~from 0^{[[up]]} to 39 wt. % Sn or Sn compounds,~~

~~from 0^{[[up]]} to 60 wt. % W or W compounds, and~~

from 0 ^{[[up]]} to 60 wt. % Bi or Bi compounds

wherein not more than one of the constituents is 0 wt. %.

3. (Currently Amended) ~~The radiation~~Radiation-protection apron of lead-substitute material according to claim 2, ~~characterised in that~~ wherein the lead substitute material comprises

from 12 to 22 wt. % matrix material,

from 0 ^{[[up]]} to 39 wt. % Sn or Sn compounds,

from 16 to 60 wt. % W or W compounds and

from 16 to 60 wt. % Bi or Bi compounds.

4. (Currently Amended) ~~The radiation~~Radiation-protection apron of lead-substitute material according to claim 1, ~~characterised in that~~ wherein the lead substitute material comprises

from 12 to 22 wt. % matrix material,

from 40 to 60 wt. % Sn or Sn compounds,

from 7 to 15 wt. % W or W compounds and

from 7 to 15 wt. % Bi or Bi compounds.

5. (Currently Amended) ~~The radiation~~Radiation-protection apron of lead-substitute material according to claim 1, ~~characterised in that~~ wherein the lead substitute material additionally comprises up to 40 wt. % of one or more of the following elements^{[[:]]} Er, Ho, Dy, Tb, Gd, Eu, Sm, La, Ce, Nd, Cs, Ba, I, Pr, ~~and/or~~ their compounds, and^{[[/or]]} CsI.

6. (Currently Amended) ~~The radiation~~Radiation-protection apron of lead-substitute material according to claim 5, ~~characterised in that~~ wherein the lead substitute material additionally comprises up to 20 wt. % of one or more of the following elements^{[[:]]} Er, Ho, Dy, Tb, Gd, Eu, Sm, La, Ce, Nd, Cs, Ba, I, Pr, ~~and/or~~ their compounds, and^{[[/or]]} CsI.

7. (Currently Amended) ~~The radiation~~Radiation-protection apron of lead-substitute material according to claim 6, ~~characterised in that~~ wherein

the lead substitute material additionally comprises up to 8 wt. % of one or more of the following elements~~[[:]]~~ Er, Ho, Dy, Tb, Gd, Eu, Sm, La, Ce, Nd, Cs, Ba, I, Pr₁ and/or their compounds, and~~[[/or]]~~ CsI.

8. (Currently Amended) ~~The radiation~~Radiation protection apron of lead substitute material according to claim 1, ~~characterised in that wherein~~ the lead substitute material additionally comprises up to 40 wt. % of one or more of the following elements~~[[:]]~~ Ta, Hf, Lu, Yb, Tm, Th, U and~~[[/or]]~~ their compounds.

9. (Currently Amended) ~~The radiation~~Radiation protection apron of lead substitute material according to claim 1, ~~8, characterised in that wherein~~ the lead substitute material additionally comprises up to 20 wt. % of one or more of the following elements~~[[:]]~~ Ta, Hf, Lu, Yb, Tm, Th, U and~~[[/or]]~~ their compounds.

10. (Currently Amended) ~~The radiation~~Radiation protection apron of lead substitute material according to claim 1, ~~9, characterised in that wherein~~ the lead substitute material additionally comprises up to 8 wt. % of one or more of the following elements~~[[:]]~~ Ta, Hf, Lu, Yb, Tm, Th, U and~~[[/or]]~~ their compounds.

11. (Currently Amended) ~~A Radiation-lead-substitute radiation~~ protection apron of lead substitute material for radiation protection purposes against radiation resulting from in the energy range of an X-ray tube having a voltage of from 60 to 90 kV according to claim 5, ~~characterised in that wherein~~ for nominal overall lead equivalents of from 0.25 to 0.6 mm the lead substitute material comprises

from 12 to 22 wt. % matrix material,

from 49 to 65 wt. % Sn or Sn compounds,

from 0 ~~[[up]]~~ to 20 wt. % W or W compounds,

from 0 ~~[[up]]~~ to 20 wt. % Bi or Bi compounds and

from 2 to 35 wt. % of one or more of the elements-Gd, Eu, Sm, La, Ce, Nd, Cs, Ba, I, Pr₂ and/or their compounds, and~~[[/or]]~~ CsI.

12. (Currently Amended) ~~A Radiation lead-substitute radiation protection apron of lead substitute material~~ according to claim 11, ~~characterised in that~~wherein the lead substitute material additionally comprises from 2 to 25 wt. % I, Cs, Ba, La, Ce, Pr and/or Nd and/or their compounds and/or CsI.

13. (Currently Amended) ~~A Radiation lead-substitute radiation protection apron of lead substitute material~~ for radiation protection ~~purposes against radiation resulting from in the energy range of~~ an X-ray tube having a voltage of from 100 to 140 kV according to claim 5, ~~characterised in that~~wherein for nominal overall lead equivalents of from 0.25 to 0.6 mm the lead substitute material comprises

from 12 to 22 wt. % matrix material,
from 40 to 73 wt. % Bi and/or W or their compounds and
from 5 to 38 wt. % of one or more of ~~the following elements~~[[:]] Gd, Eu, Er, Hf
and~~[[/or]]~~ their compounds.

14.-15. (Cancelled)

16. (Currently Amended) ~~A Radiation lead-substitute radiation protection apron of lead substitute material~~ according to claim 1, ~~characterised in that~~wherein ~~[[it]]~~ the protection apron comprises a structure of at least two protective layers of different compositions which are separate or joined together, wherein at least in one layer at least 50% of the total weight consists of only one ~~element from the group of~~ Sn, W, and Bi, or their compoundsa compound thereof.

17. (Currently Amended) ~~A Radiation lead-substitute radiation protection apron of lead substitute material~~ according to claim 1, ~~characterised in that it comprises a structure of at least two protective layers of different compositions which are separate or joined together,~~ wherein at least in one layer of the radiation protection apron at least 50% of the total weight consists only of at least 40 wt. % Sn or its compounds and at least 10 wt. % I, Cs, Ba, La, Ce, Pr and/or Nd and/or their compounds and/or CsI.

18. (Currently Amended) ~~A Radiation lead-substitute radiation protection apron of lead substitute material~~ according to claim 1, ~~characterised in that~~wherein ~~it comprises a structure of at least two protective layers of different compositions which are separate or joined together,~~

~~wherein the protective layer(s) designed to be farther more remote from the body skin layer of the wearer~~ comprise(s) predominantly [[the]] elements or their compounds having a higher X-ray fluorescent yield, and the protective layer(s) ~~else designed to be closer to the body skin layer of a wearer~~ comprise(s) [[the]] elements or their compounds having a lower X-ray fluorescent yield.

19. (Currently Amended) ~~A Radiation-lead-substitute radiation protection apron of lead substitute material~~ according to claim 1, ~~characterised in that~~ wherein ~~it the protective apron~~ comprises a structure of at least three protective layers of different compositions which are separate or joined together, wherein the protective layer(s) more remote from the body and the protective layer(s) close to the body comprise predominantly the elements having a higher atomic number or their compounds, and there is arranged in the middle at least one protective layer comprising predominantly elements having a lower atomic number.

20. (Currently Amended) ~~A Radiation-lead-substitute radiation protection apron of lead substitute material~~ according to claim 1, ~~characterised in that~~ wherein a weakly radioactive layer is embedded between two non-radioactive protective layers which are separate from or joined to the radioactive layer.

21. (Currently Amended) ~~A Radiation-lead-substitute radiation protection apron of lead substitute material~~ according to claim 1, ~~characterised in that~~ comprising [[the]] metals or metal compounds ~~that~~ are granular and ~~their have~~ particle sizes ~~that~~ exhibit a 50th percentile according to the following formula

$$D_{50} = \frac{d \cdot p}{10} \text{ mm}$$

wherein

D_{50} represents the 50th percentile of the particular size distribution,

d represents the layer thickness in mm and

p represents the proportion by weight of the particle material component in the total weight,

and the 90th percentile of the particle size distribution $D_{90} \leq 2 \cdot D_{50}$.

22. (Cancelled)

23. (Withdrawn) A method of protecting a body from radiation by using a lead substitute material for radiation protection purposes in the energy range of an X-ray tube having a voltage of from 60 to 140 kV, comprising a structure of at least two protective layers of different compositions which are separate or joined together, wherein for nominal overall lead equivalents of from 0.25 to 2.0 mm the lead substitute material comprises

from 12 to 22 wt. % matrix material,
up to 75 wt. % Sn or Sn compounds,
up to 73 wt. % W or W compounds, and
up to 80 wt. % Bi or Bi compounds,

characterized in that the protective layer(s) more remote from the body being protected comprise(s) predominantly the elements having a lower atomic number, or their compounds, and the protective layer(s) close to the body being protected comprise(s) predominantly the elements having a higher atomic number, or their compounds.

24. (Withdrawn) The method of protecting a body from radiation according to claim 23, characterised in that

the lead substitute material comprises
from 12 to 22 wt. % matrix material,
up to 39 wt. % Sn or Sn compounds,
up to 60 wt. % W or W compounds, and
up to 60 wt. % Bi or Bi compounds.

25. (Withdrawn) The method of protecting a body from radiation according to claim 23, characterised in that the lead substitute material additionally comprises up to 40 wt. % of one or more of the following elements:

Er, Ho, Dy, Tb, Gd, Eu, Sm, La, Ce, Nd, Cs, Ba, I, Pr and/or their compounds and/or CsI.

26. (Withdrawn) The method of protecting a body from radiation according to claim 23, characterised in that the lead substitute material additionally comprises up to 40 wt. % of one or more of the following elements:

Ta, Hf, Lu, Yb, Tm, Th, U and/or their compounds.

27. (Withdrawn) The method of protecting a body from radiation according to claim 25, for radiation protection purposes in the energy range of an X-ray tube having a voltage of from 60 to 90 kV, characterised in that for nominal overall lead equivalents of from 0.25 to 0.6 mm the lead substitute material comprises

- from 12 to 22 wt. % matrix material,
- from 49 to 65 wt. % Sn or Sn compounds,
- up to 20 wt. % W or W compounds,
- up to 20 wt. % Bi or Bi compounds and
- from 2 to 35 wt. % of one or more of the elements Gd, Eu, Sm, La, Ce, Nd, Cs, Ba, I, Pr and/or their compounds and/or CsI.

28. (Withdrawn) The method of protecting a body from radiation according to claim 23, characterised in that it comprises a structure of at least two protective layers of different compositions which are separate or joined together, wherein at least in one layer at least 50% of the total weight consists of only one element from the group Sn, W and Bi or their compounds.

29. (Withdrawn) The method of protecting a body from radiation according to claim 23, characterised in that it comprises a structure of at least two protective layers of different compositions which are separate or joined together, wherein the protective layer(s) more remote from the body comprise(s) predominantly the elements or their compounds having a higher X-ray fluorescent yield, and the protective layer(s) close to the body comprise(s) the elements or their compounds having a lower X-ray fluorescent yield.

30. (Withdrawn) The method of protecting a body from radiation according to claim 23, characterised in that it comprises a structure of at least three protective layers of different compositions which are separate or joined together, wherein the protective layer(s) more remote from the body and the protective layer(s) close to the body comprise predominantly the elements having a higher atomic number or their compounds, and there is arranged in the middle at least one protective layer comprising predominantly elements having a lower atomic number.

31. (Withdrawn) The method of protecting a body from radiation according to claim 23, characterised in that the metals or metal compounds are granular and their particle sizes exhibit a 50th percentile according to the following formula

$$D_{50} = \frac{d \cdot p}{10} \text{ mm}$$

wherein

D_{50} represents the 50th percentile of the particular size distribution,

d represents the layer thickness in mm and

p represents the proportion by weight of the particle material component in the total weight,

and the 90th percentile of the particle size distribution $D_{90} \leq 2 \cdot D_{50}$.